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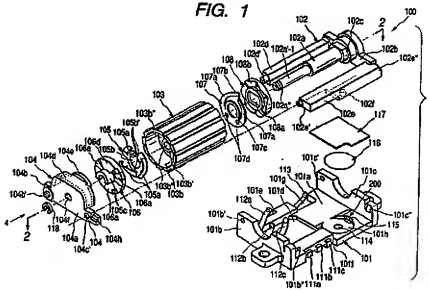
(54) Combined control-type electronic component

(57) There is provided a combined control-type electronic component which has a base made of resin to be installed on a circuit board. Installed on the base are a push switch unit, a rotary encoder unit which generates signals when a roller is turned, and externally connecting terminals which transmit signals, outputted from the push switch unit and the rotary encoder unit, to the outside. The roller is supported by a stepped shaft with a rotation axis disposed generally parallel to the surface of the circuit board. The stepped shaft is cantilevered to a base of a guide member, which in turn is supported by the base so that the roller can move in an orthogonal direction relative to the rotation axis of the stepped shaft. When the roller is pushed, the guide member is displaced, which causes the push switch unit to function.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a combined control-type electronic component, wherein turning operation and pushing operation can be made with a single switch, for the remote controllers of various electronic devices and the portable electronic devices such as portable telephones.

Description of the Related Art

[0002] Fig. 8 is a sectional side view of a rotary encoder 50 with a push switch, an example of the conventional combined control-type electric components. Fig. 9 is a sectional side view of the encoder, of which the operating knob is pushed in a horizontal direction. Fig. 10 is a partially sectional view of the rotary encoder 50 with a push switch installed in an electronic device.

[0003] As shown in Fig. 8, a rotary encoder unit 52 and a push switch unit 53 are arranged with a prescribed spacing therebetween on a mounting plate 51. The push switch unit 53 is operated by pushing an operating knob 54 of the encoder unit 52 sideways.

[0004] The rotary encoder unit 52 and the push switch unit 53 are hereunder referred to as "encoder unit 52" and "switch unit 53," respectively.

[0005] The encoder unit 52 comprises: a box-type case 55 of molded resin; elastic contact legs 57 extending upward from thin metal plates 56 which are inserted in the bottom portion of the box-type case 55 when the case is molded; connecting terminals 58 extending downward from the sides of the metal plates 56; a disk-like rotary body 61 of molded resin which has a radial-terminal plate 60 on its back and of which the center shaft 59 is so held that the rotary body 61 can turn horizontally about the center of the bottom of the box-type case 55; and a lid plate 62 to hold down the rotary body 61 to prevent it from floating up.

[0006] Made in the center shaft 59 of the rotary body 61 is a hexagonal through hole 63, of which the diameter is relatively small at its bottom portion 63A and expands gradually from there upward. The lower end 64B of a connecting rod 64 is press-fitted lightly into the small-diameter lower end portion 63A of the through hole 63, the lower end 64B and the lower end portion 63A being in point contact with each other, so that the connecting rod 64 can incline within a certain range but there is no play in the direction of rotation. The upper end lower ends 64A and 64B of the connecting rod 64 are in the shape of a relatively large hexagon, and its middle portion 64C is like a straight rod of a relatively small diameter.

[0007] The upper end 64A of the connecting rod 64 protruding upward out of the through hole 63 of the center shaft 59 of the rotary body 61 is press-fitted lightly into a hexagonal hole 66 made in a column-like lower center portion 65 of the outer-periphery-operating-type disc-like operating knob 54 disposed parallel to the rotary body 61, the upper end 64A and the hexagonal hole 66 being in point contact with each other, so that the connecting rod 64 can incline within a certain range but there is no play in the direction of rotation.

[0008] Besides, the operating knob 54 is put on an upper case 67 of molded resin which, in turn, is placed on the top of the box-type case 55, and the column portion 65 of the operating knob 54 is fitted loosely into a central flat-oval hole 68 of the upper case 67 so that the operating knob 54 can turn horizontally in a plane parallel to the rotary body 61 and move a certain distance horizontally on the straight line connecting the encoder unit 52 and the switch unit 53.

[0009] A U-shaped spring 69 is disposed between the peripheral groove 65A of the column portion 65 of the operating knob 54 and a wall portion 67A of the upper case 67, between the lid plate 62 of the encoder unit 52 and the upper case 67. While the rotary encoder 50 with a push switch is in its resting state, the U-shaped spring 69 urges the operating knob 54 to a position farthest from the switch unit 53 and prevents the operating knob 54 from floating up and coming off.

[0010] A fixing metal part 70 joins the box-type case 55 and the upper case 67 and fixes the encoder unit 52 to a mounting plate 51.

[0011] The switch unit 53 is fixed onto the mounting plate 51 so that an operating button 71 faces the encoder unit 52 and the back of the switch unit 53 comes in contact with a pushing-back wall 72 of the mounting plate 53. Connecting terminals 73 are drawn out downward from the switch unit 53.

[0012] The reference numeral 74 is a switch-driving plate, which has, on its one end, a joining portion 74A which is fitted, from outside the U-shaped spring 69, on the column portion 65 for relative turning movement therebetween and, on the other end, a driving portion 74B which is in contact with the operating button 71 of the switch unit 53.

[0013] Next, the workings of the conventional rotary encoder 50 with a push switch will be described.

[0014] As shown in Fig. 8, by applying force to the periphery 54A of the operating knob 54 in the tangent direction shown in the Fig. 8 to turn it and the connecting rod 64, the disc-like rotary body 61 of the encoder unit 52 is turned about the center of the bottom of the box-type case 55 via the connecting rod 64. Accordingly, the elastic contact legs 57 slide on the radial-terminal plate 60 under the rotary body 61, keeping elastic contact with the plate, to generate pulse signals in accordance with the turn of the operating knob 54.

[0015] At the time, the switch-driving plate 74 does not turn because its joining portion 74A is fitted on the column portion 65 for relative turning movement therebetween.

[0016] The above pulse signals are transmitted from the elastic contact legs 57 through the connecting terminals 58 to a circuit of a printed circuit board 75 (refer to Fig. 10) of an electronic device.

[0017] Then, when force is applied, as shown in Fig. 9, to the periphery 54A of the disc-like operating knob 54 in the direction of the straight line from the center of the operating knob 54 to the switch unit 53 against the force of the U-shaped spring 69 urging the operating knob 54 away from the switch unit 53, the column portion 65 of the operating knob 54 is guided by the flat-oval hole 68 of the upper case 67 and the operating knob 54 and the switch-driving plate 74 move horizontally, the driving portion 74B of the switch-driving plate 74 pushes the operating button 71 to put the switch unit 53 into working, and the signal thus generated is transmitted through the connecting terminals 73 to the circuit of the printed circuit board 75 of the electronic device.

[0018] At the time, the connecting rod 64 inclines, of which the upper and lower ends 64A and 64B is press-fitted lightly into the hexagonal hole 66 of the column portion 65 of the operating knob 54 and the lower end 63A of the through hole 63 of the center shaft 59 of the rotary body 61, respectively, as already described.

[0019] When the pushing force on the disc-like operating knob 54 is removed, the elastic restoring force of the U-shaped spring 69 pushes the operating knob 54 and the switch-driving plate 74 back to their resting positions shown in Fig. 8. At the same time, the connecting rod 64 is returned into its erect state.

[0020] Fig. 10 shows the conventional rotary encoder 50 with a push switch which is installed in an electronic device. The legs 51A under the mounting plate 51, the connecting terminals 58 of the encoder unit 52, and the connecting terminals 73 of the switch unit 53 are inserted in and soldered to the holes 76, 77, and 78 of the printed circuit board 75 of the electronic device, and the portion of the periphery 54A of the disc-like operating knob 54 farthest from the switch unit 53 protrudes out of an aperture of the casing 79.

[0021] As described above, the rotary encoder 50 with a push switch is mounted on the printed circuit board 75 which is disposed along the bottom 79A of the casing 79 of the electronic device, as shown in Fig. 10, so as to protrude a portion of the periphery 54A of the disc-like operating knob 54 out of the aperture made in a side of the casing 79 of the electronic device. Thus, the operating knob 54 is operated on the side of the casing 79. Accordingly, when the rotary encoder 50 with a push switch is installed in a thin electronic device such as a remote controller or a portable telephone, there is restriction on the arrangement of parts because the disc-like operating knob 54 has to be arranged in a limited space near a side of the casing of the electronic device.

[0022] Besides, the freedom of design of electronic devices is often restricted for the limited space.

[0023] Moreover, when one takes such a thin electronic device in one's hand, one usually does so by putting one's fingers on both sides of the device. In this case, a finger touches inadvertently the operating knob 54 protruding out of the casing of the device. Thus, the electronic device is not handy to handle.

[0024] Furthermore, when the periphery 54A of the operating knob 54 is pushed horizontally to operate the switch unit 53, the connecting rod 64 between the encoder unit 52 and the operating knob 54 inclines as shown in Fig. 9. Accordingly, the structure of the conventional combined control-type electronic part has to be complex.

[0025] In addition, it is difficult to assemble the rotary encoder 50 with a push switch, which raises its manufacturing cost.

[0026] Besides, the upper and lower ends 64A and 64B are press-fitted lightly into the hexagonal hole 66 of the column portion at a lower part of the operating knob 54 and the lower end 63A of the through hole 63 in the center shaft 59 of the rotary body 61, respectively. Accordingly, to allow the connecting rod 64 to incline smoothly and thereby allow the operating knob 54 to be pushed and moved horizontally smoothly, there must be some slackness, or play, at the joint between the connecting rod 64 and the encoder unit 52 and at the joint between the connecting rod 64 and the operating knob 54. However, the press fitting mentioned above precludes the possibility of the operating knob 54's smooth operation. On the other hand, if some slackness, or play, is given to the joints, the operating knob 54 can be pushed and moved smoothly, but the slackness, or play, directly means play in the turning of the operating knob 54. The play in the turning of the operating knob 54 causes the turning lag of the rotary body 61 behind the operating knob 54.

[0027] Thus, it is difficult to secure both the stable horizontal movement and the stable turn of the operating knob 54, which reduces the reliability and spoils the operational smoothness of the rotary encoder 50 with a push switch, and gives a sloppy feel to the operator.

SUMMARY OF THE INVENTION

[0028] It is therefore an object of the present invention to provide a combined control-type electronic component which has large freedom of installation and relatively simple structure, is inexpensive to manufacture and excellent to operate, has high reliability, and can also be applied to combined control-type electronic components with rotary encoder units.

[0029] As a first solving means for above problems, there is provided a combined control-type electronic device which has a base of an insulating material to be installed on a circuit board. Installed on the base are a push switch unit; a rotary unit which generates signals when an operating member is turned; and externally connecting terminals which transmit signals, outputted from the push switch unit and the rotary unit, to the out-

side. The operating member is supported by a supporting member with a rotation axis disposed generally parallel to the surface of the circuit board. The supporting member is installed on and fixed to a guide member, which in turn is supported by the base so that the operating member can move in an orthogonal direction relative to the rotation axis of the supporting member. When the operating member is pushed, the guide member is displaced, which causes the push switch unit to function.

[0030] As a second solving means, there is provided the combined control-type electronic device, wherein the rotary unit has a contact member and a terminal plate which is disposed coaxially with the operating member and on which a circuit pattern is formed. The contact member slides on the circuit pattern, keeping elastic contact with it. The contact member and the terminal plate move as a unit with the operating member when the operating member is pushed.

[0031] As a third solving means, there is provided the combined control-type electronic device, wherein the contact member is installed fixedly to one end of the operating member, the circuit pattern is formed on both sides of the terminal plate and connected as prescribed, the contact member slides on the circuit pattern on one side of the terminal plate, keeping contact with the circuit pattern, and fixed contacts connected to the externally connecting terminals slide on the pattern on the other side of the terminal plate, keeping elastic contact with the pattern, and the terminal plate is installed on the guide member, its turning checked.

[0032] As a fourth solving means, there is provided the combined control-type electronic device, wherein the operating member is provided at the other end with a click spring turning as a unit with the operating member or a click plate disposed coaxially with the operating member, and the click plate engaging the click spring or the click spring engaging the click plate is installed fixedly on the guide member, as the case may be, a concavity or convex on the click spring slides on an area of radial projections and recesses on the click plate, keeping elastic contact with the area, to click the operating member.

[0033] As a fifth solving means, there is provided the combined control-type electronic device, wherein a recess round and deep in the direction of the rotation axis of the operating member is made in each end surface of the operating member, the contact member and the terminal plate are inserted in the recess of one end of the operating member and the click spring and the click plate are inserted in the recess of the other end of the operating member.

[0034] As a sixth solving means, there is provided the combined control-type electronic device, wherein the guide member has a first supporting part on one side of the rotation axis of the supporting member and a second supporting part on the other side of the rotation axis, the first supporting part is provided with pivots on which the guide member turns, a pressing-down part is provided on such a surface of the second supporting part as faces the push switch unit, and the pressing-down part presses down the push switch unit when the operating member is pushed.

[0035] As a seventh solving means, there is provided the combined control-type electronic device, wherein the base is made of resin and the fixed contacts are inserted in the base so as to protrude from the base when the base is molded. Thus, the fixed contacts are held by and fixed to the base.

[0036] As an eighth solving means, there is provided the combined control-type electronic device, wherein the rotary unit is a rotary encoder unit.

[0037] As a ninth solving means, there is provided the combined control-type electronic device, wherein the circuit pattern is a radial conductive pattern formed plane-symmetrically on both sides of the terminal plate.

[0038] As a tenth solving means, there is provided a combined control-type electronic device which has a base of an insulating material to be installed on a circuit board. Installed on the base are a push switch unit which outputs a signal when an operating member is pushed; a rotary unit which generates signals when the operating member is turned; and externally connecting terminals which transmit signals, outputted from the push switch unit and the rotary unit, to the circuit board. The externally connecting terminals are connected to the circuit board, which is installed in an electronic device. The operating member protrudes out of an aperture made in the front panel of the electronic device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039]

Fig. 1 is an exploded perspective view of a rotary encoder 100 with a push switch, an embodiment of the combined control-type electronic component of the present invention;

Fig. 2 is a sectional view of a rotary encoder 100 with a push switch, an embodiment of the present invention, taken along arrowed line 2-2 of Fig. 1;

Fig. 3 is a plan view of the base 101 of the rotary encoder 100 with a push switch, an embodiment of the present invention;

Fig. 4 is a front view of the terminal plate 106 of the rotary encoder 100 with a push switch, an embodiment of the present invention, as seen in the direction of arrow 4 of Fig. 1;

Fig. 5 is to describe the operation of the roller 103 of the rotary encoder 100 with a push switch, an embodiment of the present invention;

Fig. 6 is to describe the operation of the roller 103 of the rotary encoder 100 with a push switch, an embodiment of the present invention;

Fig. 7 is a partially sectional, perspective view of the rotary encoder 100 with a push switch, an embodi-

ment of the present invention, installed on an electronic device 300;

Fig. 8 is a sectional side view of a rotary encoder 50 with a push switch, an example of the conventional combined control-type electronic device;

Fig. 9 is a sectional side view of the conventional combined control-type electronic device, of which the operating knob is pushed in a horizontal direction; and

Fig. 10 is a partially sectional view of the conventional combined control-type electronic device installed in an electronic device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0040] Referring to Figs. 1 to 7, an embodiment, that is, a rotary encoder 100 with a push switch, of the combined control-type electronic component of the present invention will be described.

[0041] As shown in Fig. 1, the rotary encoder 100 with a push switch consists mainly of a base 101, a guide member 102, an operating member, namely, a roller 103, a cover 104, a contact member 105, a terminal plate 106, a click spring 107, and a click plate 108.

[0042] Each member will be described below.

[0043] The base 101 is made of resin and comprises a rectangular bottom plate 101a and end walls 101b and 101c at the longitudinal ends of the bottom plate 101a as shown in Fig. 1. The bottom plate 101a has an aperture 101d near the end wall 101b, a notches 101e and 101f opposite to both edge parts in a lateral direction at the end wall 101b side, a notch 101g in the same side as the notch 101e, and a circular recess 101h on the side opposite to the notch 101g. A through hole 101b' is made in the end wall 101b and another through hole 101c' is made in the end wall 101C, their axes aligned with each other. Besides, a claw-like stopper 101b" is formed on the inner surface of the end wall 101b opposite to the through hole 101b' near the side of the bottom plate 101a wherein the notch 101f is made and another claw-like stopper 101c" is formed on the inner surface of the end wall 101c opposite to the through hole 101c' near the same side of the bottom plate 101a.

[0044] As shown in Figs. 1 to 3, externally connecting terminals 110a and 110b, each made of an elastic conductive metal plate, protrude from the bottom plate 101a into the notch 101e; externally connecting terminals 111a, 111b, and 111c, into the notch 101f. These externally connecting terminals are fixed in the notches by inserting them into the guide member 101 when the base is molded. Fixed terminals 112a, 112b, and 112c, each made of an elastic conductive metal plate, protrude from the edge, along the end wall 101b, of the aperture 101d (see Figs. 2 and 3). Besides, protruding in the notch 101g is an elastic contact leg 113 made of an elastic conductive metal plate and having a convex on its tip.

[0045] A fixed contact 114 made of an elastic conductive metal plate is exposed at the center of the recess 101h in the bottom plate 101a. The fixed contact 114 is inserted in the bottom plate 101a's portion when the base is molded. A ground pattern 115 made of an elastic conductive metal plate is exposed in an area along the periphery of the recess 101h. The ground pattern 115 is inserted in the bottom plate 101a's portion when the base is molded (refer to Figs. 1 and 3). As shown in Fig. 3, the fixed terminals 112a, 112b, and 112c are connected to the externally connecting terminals 110a, 111a, and 111b, respectively. Their connection is made through the bottom plate 101a. On the other hand, the fixed contact 114 is connected to the externally connecting terminal 111c, and the ground pattern 115 and the elastic contact leg 113 are connected to the externally connecting terminal 110b.

[0046] As shown in Fig. 1, a movable contact 116, namely, a dome-shaped conductive plate spring (being convex in Fig. 1) is put in the recess 101h of the bottom plate 101a, and an insulating sheet 117, of which one side is adhesive, is affixed to the top of the bottom plate 101a to cover the movable contact 116. Part of the periphery of the movable contact 116 is in contact with the ground pattern 115 in the recess 101h. Thus constituted in the recess 101h is a push switch unit 200. When the movable contact 116 is pressed down, its center part comes in contact with the fixed contact 114 to connect it to the ground pattern 115.

[0047] As shown in Fig. 1, the guide member 102 comprises a stepped shaft 102a, a base 102b to cantilever the stepped shaft 102a, an engaging part 102c formed at the root of the stepped shaft 102a, its section being in the shape of oval, and an arm 102d on one side of the stepped shaft 102a and another 102e on the other side, the arms 102d and 102e parallel to each other. The arms 102d and 102e and the base 102b constitute a U-shape. In the present embodiment, the stepped shaft 102a, the base 102b, the engaging part 102c, and the arms 102d and 102e are formed as a single piece by aluminium die casting.

[0048] The small-diameter portion 102a'-1 of the stepped shaft 102a has a D-shaped section A(refer to Fig. 2) and a groove 102a" in the periphery of its front end. A C-shaped washer 118 is fitted in the groove 102a". A projection 102d' and another 102d" (not shown) protrude from the front and rear ends of the arm 102d, respectively, in the direction parallel to the axis of the stepped shaft 102a. The arm 102d and the projections 102d' and 102d" are formed as one piece. On the other hand, the arm 102e has on its front end a projection 102e' protruding in the direction parallel to the axis of the stepped shaft 102a and on its rear end an engaging part 102e". Besides, a projection 102f is formed downward on the bottom surface of the arm 102e.

[0049] Referring to Figs. 1 and 2, the roller 103 will be described. The roller 103 is molded in resin as one

piece. Slip-preventive grooves are formed in the longitudinal direction in the periphery of the roller 103. A stepped center hole 103a is formed along the rotation axis of the roller 103. Recesses 103b and 103c round and deep in the direction of the rotation axis of the roller 103 are formed in the end surfaces of the roller 103, respectively. A cylindrical engaging part 103b' is formed at the bottom of the recess 103b, and three projections 103b" are formed radially on the periphery of the engaging part 103b' (see Fig. 1).

[0050] The contact member 105 in Figs. 1 and 2 are made of an elastic conductive metal disc, which has three contact legs 105a formed along its periphery, a center through hole 105b, and three notches 105b' made radially in the edge of the center through hole 105b.

[0051] The terminal plate 106 shown in Figs. 1, 2, and 4 is disc-shaped and has radially arranged circuit patterns, that is, three conductive patterns 106a, 106a, and 106a. The gaps between the conductive patterns 106a are filled with resin so that the conductive patterns 106a are fixed as a unit. Because each conductive pattern 106a is formed by a conductive metal plate having approximately the same thickness as the terminal plate 106, plane-symmetric patterns 106a and 106a are formed on the front and back surfaces of the terminal plate 106, one pattern on each surface. Besides, a D-shaped through hole 106b (see Fig. 4) is made in the center of the terminal plate 106, and a semi-cylindrical engaging part 106c is formed so as to surround the edge of the through hole 106b, on one side of the terminal plate 106. A sectoral engaging part 106d is formed, joining with the engaging part 106c.

[0052] The click spring 107 shown in Figs. 1 and 2 is made of an elastic metal disc, which has two elastic legs 107a and 107a formed so as to be bent along its periphery. A convex 107b is formed at the connection of each elastic leg 107a's tip. A through hole 107c is made at the center of the click spring 107, and two small holes 107d and 107d are made under the through hole 107c in Fig. 1.

[0053] The click plate 108 shown in Fig. 1 is a resin disc, which has a hole 108a in the shape of oval, and an area of radial projections and recesses 108b on its one side.

[0054] As shown in Figs. 1 and 3, the cover 104 consists mainly of a base plate 104a, arms 104b and 104c protruding left and right from the lower part of the base plate 104a, a wall 104d formed along the edge of the upper part of the base plate 104a and protruding to one side of the base plate 104a, and an arch-shaped hold-down 104e protruding further from the middle part of the top of the wall 104d. Besides, a D-shaped through hole 104f is made at the center of the base plate 104a, and a semi-cylindrical hold-down 104g is formed along the edge of the upper part of the through hole 104f so as to protrude to the same side as the wall 104d (see Fig. 2). A projection 104b' is formed on the side of the arm 104b opposite to the guide member 102, the projection 104d' and the projection 102d'of the arm 102d of the guide member 102 aligned with each other. A hole 104b" (not shown) is made in the other side of the arm 104b, the hole 104b" and the projection 104b' aligned with each other. On the other hand, a through hole 104c' is made in the arm 104c, the through hole 104c' and the projection 102e' of the arm 102e of the guide member 102 aligned with each other, and an engaging part 104h is formed by the through hole 104c'. The cover 104 is molded as one piece by aluminium die casting.

[0055] Referring to Figs. 1 and 2, the assembled condition of each member will be described next.

[0056] The through hole 105b of the contact member 105 is fitted on the engaging part 103b' at the bottom of the recess 103b of the roller 103, the contact member 105 thus positioned and fixed. Accordingly, the contact member 105 is prevented from turning relatively to the roller 103 by the engagement between the projections 103b" of the engaging part 103b' and the notches 105b' in the periphery of the through hole 105b of the contact member 105.

[0057] On the other hand, the small holes 107d and 107d of the click spring 107 are fitted on the projections 103d (see Fig. 2) at the bottom of the recess 103c, and the tips of the projections 103d protruding out of the holes 107d and 107d are melted and crushed (the melted and crushed state is not shown) to fix the click spring 107.

[0058] The oval-shaped hole 108a of the click plate 108 is fitted on the engaging part 102c at the root of the stepped shaft 102a of the guide member 102, and thereby the click plate 108 is fixed to the stepped shaft 102a and prevented from turning relatively to the stepped shaft 102a. The stepped shaft 102a is inserted through the center hole 103a of the roller assembly 103. Thus, the roller 103 is rotatably supported by the guide member 102. In this state, the convexes 107b of the click spring 107 fixed to the roller 103 press the area of radial projections and recesses 108b of the click plate 108. Because the step of the stepped shaft 102a checks the movement of the roller 103 toward the base 102b of the guide member 102, the spacing between the click spring 107 and the click plate 108 is kept constant, and hence the pressure exerted by the convexes 107b of the click spring 107 against the area of radial projections and recesses 108b of the click plate 108 is kept constant. Thus, the roller 103 can be clicked with uniform turning force.

[0059] Moreover, the D-shaped through hole 106b of the terminal plate 106 is fitted on the small-diameter portion 102a'-1 of the stepped shaft 102a. Thus, the terminal plate 106 is fixed on the stepped shaft 102a and its turning on the shaft is checked, and the side of the terminal plate 106 opposite to the side where the engaging part 106c is formed presses the elastic contact legs 105a of the contact member 105 which is fixed to the roller 103. Furthermore, the through hole 104f of

the cover 104 is fitted on the small-diameter portion 102a'-1 of the stepped shaft 102a. Thus, the cover 104 is fixed on the stepped shaft 102a and its turning on the shaft is checked. The spring washer 108 is fitted in the groove 102a of the stepped shaft 102a to prevent the parts on the stepped shaft 102a from coming off. At the time, the hold-downs 104e and 104g formed on the cover 104 come in contact with the engaging parts 106d and 106c, respectively, to position the terminal plate 106.

[0060] The projections 102d' and 102d" on both ends of the arm 102d of the guide member 102 shown in Fig. 1 are fitted into the through holes 101b and 101c, respectively, of the end walls 101b and 101c of the base 101. Thus, the guide member 102 is supported by the base 101 so that the former can turn on the latter. While the roller 103 is not pushed, the projection 102f of the arm 102e is held on the center of the dome-shaped movable contact 116 as shown in Fig. 5. On the other hand, the stoppers 101b" and 101c" of the end walls 101b and 101c of the base 101 engages, from above, the engaging part 104h of the cover 104 and the engaging part 102e" of the arm 102e, respectively. Thus, the turning of the guide member 102 is checked to keep the projection 102f within a prescribed distance of the top of the movable contact 116.

[0061] As shown in Fig. 4, the terminal plate 106 is disposed so that the fixed terminals 112a, 112b, and 112c of the bottom plate 101a of the base 101 come in elastic contact with prescribed places on the engaging part 106c's side of the terminal plate 106.

[0062] Moreover, the elastic contact leg 113 in the notch 101g of the base 101 (see Fig. 3) is put into elastic contact with the bottom of the arm 102d of the guide member 102 as shown in Fig. 5 so as to ground the guide member 102 through itself and, thereby, prevent the guide member 102 from taking a charge.

[0063] Now the workings of the rotary encoder 100 with a push switch will be described.

[0064] The turning operation of the roller 103 will first be described.

[0065] As shown in Fig. 5, when the roller 103 is turned by applying force T to the periphery of the roller 103 tangentially, the contact member 105 shown in Fig. 2 turns as a unit with the roller 103 and the elastic contact legs 105a, 105a, and 105a slide on the terminal plate 106 in a peripheral direction, keeping elastic contact with it, and comes into contact with the conductive patters 106a to generate pulse signals in accordance with the turn of the roller 103.

[0066] These pulse signals are outputted to the outside through the fixed contacts 112a, 112b, and 112c in contact with the conductive patterns 106a on the opposite side of the contact member 105 of the terminal plate 106 and the externally connecting terminals 110a, 111a, and 111b.

[0067] While the roller 103 is not turned, the convexes 107b of the click spring 107 shown in Fig. 2 engage recesses of the area of radial projections and recesses 108b of the click plate 108 and the elastic contact legs 105a of the contact member 105 are out of contact with the conductive patterns 106a so that no pulse signals are outputted from the externally connecting terminals 110a, 111a, and 111b.

[0068] Next the pushing operation of the roller 103 to a bottom plate 101a of the base 101 will be described.

[0069] Fig. 5 shows the roller 103 which is not pushed. When the roller 103 is pushed by force F as shown in Fig. 6, the projection 102f of the guide member 102 joined to the roller 103 presses and displaces the center of the movable contact 116 against its elastic force toward the fixed contact 114 of the bottom plate 101a.

[0070] When the pressure on the movable contact 116 reaches a prescribed level, the movable contact 116 yields to the pressure to come into contact with the fixed contact 114. Thus, the push switch unit 200 functions. The signals thus generated are outputted from the externally connecting terminals 110b and 111c (refer to Fig. 3) to the outside.

[0071] When the pushing force F on the roller 103 is removed, the elastic restoring force of the movable contact 116 pushes the guide member 101 and the roller 103 back into the states shown in Fig. 5.

[0072] Fig. 7 shows the rotary encoder 100 with a push switch installed in an electronic device. The rotary encoder 100 with a push switch is mounted on the circuit board 250, which is disposed parallel to the front panel 300a of the electronic device 300, and the externally connecting terminals 110a, 110b, 111a, 111b, and 111c (refer to Fig. 3) are connected to the circuit board 250 by soldering. And, the front portion 103a of the roller 103 protrudes out of e rectangular aperture 300b made in the front panel 300e. Though not shown, in case that the electronic device 300 is, for example, a portable telephone, number buttons, a power-on/off button, and other operating buttons are arranged on the front panel 300a.

[0073] As described above, by installing the rotary encoder 100 with a push switch of the present embodiment in a thin electronic device 300 such as a remote controller or a portable telephone so that the front portion of the roller 103 protrudes out of an aperture made in the front panel 300a, the degree of freedom of arrangement is raised. The degree of freedom in designing electronic devices is also raised. Besides, when one takes such a thin electronic device in one's hand, one usually does so by putting one's fingers on both sides of the device. However, because the roller 103 is disposed projectingly on the front panel 300, one's fingers do not touch the roller 103 inadvertently. Thus, the above-described electronic device becomes easier to operate. The roller 103 may be disposed so as to be flush with the front panel 300a. Besides, the aperture 300b in the front panel 300a is not necessarily rec-

tangular and it may be rather round. Furthermore, the roller 103 may be exposed at a curved part of the front panel.

[0074] In addition, the rotary encoder unit comprises the contact member 105 and the terminal plate 106 which is disposed coaxially with the roller 103 and has the conductive patterns 106a on which the contact member 105 slides, keeping elastic contact with them, the contact member 105 and the terminal plate 106 are displaced together with the roller 103 when the roller 103 is pushed, and the contact member 105 is directly fixed to and driven by the roller 103, whereby the structure of the rotary encoder 100 with a push switch can be made simple. Accordingly, it can be assembled easily in a relatively short time and its manufacturing cost becomes relatively low. Moreover, because the relative positions of the contact member 105 and the terminal plate 106 do not change, unnecessary pulse signals are not generated when the roller 103 is pushed. Thus, the reliability of the rotary encoder 100 with a push switch is high.

[0075] Furthermore, the contact member 105 is fixed to one end of the roller 103, the conductive patterns 105a are formed on both sides of the terminal plate 106 and connected as prescribed, the contact member 105 slides on one side of the terminal plate 106, keeping elastic contact with it, the fixed contacts 112a, 112b, and 112c connected to the externally connecting terminals 110a, 111a, and 111b slide on the other side of the terminal plate 106, keeping elastic contact with it, and the terminal plate 106 is provided to the guide member 102 while the turning of the terminal plate 106 on the stepped shaft 102a is checked. Accordingly, the elastic force of the contact member 105 acts on the one side of the terminal plate 106 and the elastic force of the fixed contacts 112a, 112b, and 112c acts on the other side of the terminal plate 106. Therefore, the terminal plate 106 stays in its position without moving in one direction or the other. Accordingly, the elastic force on both sides of the terminal plate 106 is stable, and pulse signals generated while the contact member 105 is sliding on the terminal plate 106 are sent stably to the externally connecting terminals 110a, 111a, and 111b through the fixed contacts 112a, 112b, and 112c. Thus, the reliability of the rotary encoder 100 with a push switch is high.

[0076] In addition, because the click spring 107 is fixed to the bottom of the recess 103c of the roller 103 and the click plate 108, which engages the click spring 107, is fixed to the guide member 102 and the roller 103 is clicked by putting the convexes 107b of the click spring 107 into contact with the area of radial projections and recesses 108b of the click plate 108, the elastic force by the contact member 105 acts on one side of the roller 103 and the elastic force by the click spring 107 acts on the other side of the roller 103. Therefore, the resultant axial force on the roller 103 is almost zero, and hence the roller 103 can be turned smoothly, making the device easier to operate and giving a better feel to the operator.

[0077] Moreover, the recesses 103b and 103c are made in the end surfaces of the roller 103, respectively, the contact member 105 and the terminal plate 106 are inserted in the recess 103b, and the click spring 107 and the click plate 108 are inserted in the recess 103c, whereby the length of the roller 103 can be reduced and hence the rotary encoder 100 with a push switch can be made compact. If it is not necessary to reduce the rotary encoder 100 with a push switch in size, the roller 103 can be made longer, increasing the area of contact between a finger and the periphery of the roller 103 and, thereby, making the roller 103 easier to operate.

[0078] Furthermore, the guide member 102 has the arms 102d and 102e arranged on both sides of the stepped shaft 102a. The arm 102d is provided with pivots on which the guide member 102 turns, the projection 102f is provided at such place on the bottom surface of the arm 102e as faces the push switch unit 200 and the projection 102f presses the push switch unit 200 when the roller 103 is pushed. Accordingly, the distance from the pivots to the projection 102f is long and hence a large stroke of the roller 103 is secured within a limited turning angle of the guide member 102, which gives a better feel to the operator.

[0079] Besides, the base 101 is made of resin, and the fixed contacts 112a, 112b, and 112c are inserted in the bottom plate 101a's portion when the base 101 is molded. Therefore, parts for fixing the fixed contacts 112a, 112b, and 112c are unnecessary, which contributes to the reduction of the number of parts. In addition, because the base 101 is molded as a unit with the fixed contacts 112a, 112b, and 112c, the manufacturing process is relatively simple and the manufacturing cost is relatively low.

[0080] Moreover, the radial conductive patterns 106a on both sides of the terminal plate 106 are plane-symmetric, and each conductive pattern is formed from a single metal plate. Therefore, the manufacturing process of the terminal plate 106 is simpler and its manufacturing cost is lower as compared with those of a terminal plate of which the conductive patterns are formed by depositing thin metal films on both sides.

[0081] In the present embodiment, description has been made about the rotary encoder 100 with a push switch. It is needless to say, however, that the rotary unit can be a rotary variable resistor, etc. Further, the push switch unit 200 is formed on the bottom plate 101a of the base 101. However, a push switch can be used singly instead of the push switch unit 200.

[0082] As is described above, according to the present invention, there is provided a combined control-type electronic device which has a base of an insulating material to be installed on a circuit board. Installed on the base are a push switch unit, a rotary unit which generates signals when an operating member is turned, and externally connecting terminals which transmit sig-

nals, outputted from the push switch unit and the rotary unit, to the outside. The operating member is supported by a supporting member with a rotation axis disposed generally parallel to the surface of the circuit board. The supporting member is installed on and fixed to a guide member, which in turn is supported by the base so that the operating member can move in an orthogonal direction relative to the rotation axis of the supporting member. When the operating member is pushed, the guide member is displaced, which causes the push switch unit to function. Thus, by installing the operating member particularly in a thin electronic device such as a remote controller or a portable telephone so that the operating member protrudes from the front panel, installation in a relatively wide area of the front panel is possible and the degree of freedom of arrangement is raised. The degree of freedom in designing electronic device is also raised. Besides, when one takes such a thin electronic device in one's hand, for example, one usually does so by putting one's fingers on both sides of the device. However, because the operating member is projected not to the sides of the electronic device but to the front panel, one's fingers do not touch the operating member inadvertently. Thus, the above-described electronic devices are handy to handle.

[0083] In addition, the rotary unit comprises the contact member and the terminal plate which is disposed coaxially with the operating member and has the circuit patterns on which the contact member slides, keeping elastic contact with them, and the contact member and the terminal plate are displaced together with the operating member when the operating member is pushed. By this constitution, a link mechanism between the operating member and the rotary unit having the contact member and the terminal plate is not necessary and the structure of the rotary unit becomes simple. Accordingly, it can be assembled easily in a relatively short time. Therefore, its manufacturing cost is relatively low. Moreover, because the relative positions of the contact member and the terminal plate do not change, unnecessary signals are not generated when the operating member is pushed. Thus, the reliability of the rotary unit is high.

[0084] Furthermore, the contact member is fixed to open end of the operating member, the circuit patterns are formed on both sides of the terminal plate and connected as prescribed, the contact member slides on one side of the terminal plate, keeping elastic contact with it, the fixed contacts connected to the externally connecting terminals slide on the other side of the terminal plate, keeping elastic contact with it, and the terminal plate is provided to the guide member while the turning of the terminal plate on the stepped shaft is checked. Thus, the elastic force of the contact member acts on the one side of the terminal plate and the elastic force of the fixed contacts acts on the other side of the terminal plate. Therefore, the terminal plate stays in its position without moving in one direction or the other. Accordingly, the elastic force on both sides of the terminal plate is stable, and signals generated while the contact member is sliding on the terminal plate are sent stably to the externally connecting terminals, and through the fixed contacts. Thus, the reliability of the rotary encoder with a push switch is high.

[0085] Further, there is provided the combined control-type electronic device, wherein the operating member is provided at the other end with a click spring turning as a unit with the operating member or a click plate disposed coaxially with the operating member, and the click plate engaging the click spring or the click spring engaging the click plate is installed fixedly on the guide member, as the case may be, a concavity or convex on the click spring slides on an area of radial projections and recesses on the click plate, keeping elastic contact with the area, to click the operating member. Accordingly, the elastic force by the contact member acts on one side of the operating member and the elastic force by the click spring acts on the other side of the operating member. Therefore, the resultant axial force on the operating member is almost zero, and hence the operating member can be turned smoothly, making the device easier to operate and giving a better feel to the operator.

[0086] Further, there is provided the combined control-type electronic device, wherein a recess round and deep in the direction of the rotation axis of the operating member is made in each end surface of the operating member, the contact member and the terminal plate are inserted in the recess of one end of the operating member the click spring and the click plate are inserted in the recess of the other end of the operating member. Therefore, the length in the direction of the rotation axis of the operating member can be reduced and hence the combined control-type electronic part can be made compact. If it is not necessary to reduce the combined control-type electronic part in size, the operating member can be made longer, increasing the area of contact between a finger and the periphery of the operating member and, thereby, making the operating member easier to operate.

[0087] Further, there is provided the combined control-type electronic device, wherein the guide member has a first supporting part on one side of the rotation axis of the supporting member and a second supporting part on the other side of the rotation axis, the first supporting part is provided with pivots on which the guide member turns, a pressing-down part is provided on such a surface of the second supporting part as faces the push switch unit, and the pressing-down part presses down the push switch unit when the operating member is pushed. Therefore, the distance from the pivots to the pressing-down part is long and hence a large stroke of the operating member is secured within a limit turning angle of the guide member, which gives a better feel to the operator.

[0088] Besides, the base is made of resin, and the

fixed contacts are inserted in the bottom plate's portion when the base is molded. Therefore, other parts for fixing the fixed contacts are not necessary, which contributes to the reduction of the number of parts. In addition, because the base is molded as a unit with the fixed contacts, the manufacturing process is relatively simple and the manufacturing cost is relatively low.

[0089] Further, since the rotary unit is a rotary encoder unit, as described in the embodiment of the present invention, it can be applied to the rotary encoder with a push switch having a rotary encoder unit which outputs pulse signals generated while the contact member is sliding on the terminal plate.

[0090] Further, the circuit pattern is a radial conductive pattern formed plane-symmetrically on both sides of the terminal plate. Accordingly, the conductive patterns do not have to be formed by depositing thin metal films on both sides of a terminal plate, but each conductive pattern can be formed from a single metal plate. Therefore, the manufacturing process of the terminal plate is simpler and its manufacturing cost is lower.

[0091] Further, there is provided a combined control-type electronic device which has a base of an insulating material to be installed on a circuit board, installed on the base are a push switch unit which generates signals when an operating member is pushed; a rotary unit which generates signals when the operating member is turned; and externally connecting terminals which transmit signals, outputted from the push switch and the rotary unit, to the circuit board. The externally connecting terminals are connected to the circuit board, which is installed in an electronic device. The operating member protrudes out of an aperture made in the front panel of the electronic device. By installing the operating member in a thin electronic device such as a remote controller or a portable telephone so that the front portion of the operating member protrudes out of an aperture made in the front panel, the degree of freedom of arrangement is raised. The degree of freedom in designing electronic device is also raised. Besides, when one takes such a thin electronic device in one's hand, one usually does so by putting one's fingers on both sides of the device. However, because the operating member is disposed on neither of the sides of the electronic device, one's fingers do not touch the operating member inadvertently, which makes the electronic device easier to operate.

Claims

1. A combined control-type electronic component comprising a base of an insulating material to be installed on a circuit board, the base having thereon a push switch unit; a rotary unit generating signals when an operating member is turned; and externally connecting terminals transmitting signals, outputted from the push switch unit and the rotary unit, to the outside, wherein;

   the operating member is supported by a supporting member with a rotation axis disposed generally parallel to the surface of the circuit board, the supporting member is installed on and fixed to a guide member, which in turn is supported by the base so that the operating member can move in an orthogonal direction relative to the rotation axis, and when the operating member is pushed, the guide member is displaced, which causes the push switch unit to function.

2. A combined control-type electronic component according to claim 1, wherein the rotary unit has a contact member and a terminal plate which is disposed coaxially with the operating member and on which a circuit pattern is formed, the contact member slides on the circuit pattern, keeping elastic contact with it, and the contact member and the terminal plate move as a unit with the operating member when the operating member is pushed.

3. A combined control-type electronic component according to claim 2, wherein the contact member is installed fixedly to one end of the operating member, the circuit pattern is formed on both sides of the terminal plate and connected as prescribed, the contact member slides on the circuit pattern on one side of the terminal plate, keeping contact with the circuit pattern, and fixed contact members connected to the externally connecting terminals slide on the pattern on the other side of the terminal plate, keeping elastic contact with the pattern, and the terminal plate is installed on the guide member, its turning checked.

4. A combined control-type electronic component according to any of claims 1 to 3, wherein the operating member is provided at the other end with a click spring turning as a unit with the operating member or a click plate disposed coaxially with the operating member, and the click plate engaging the click spring or the click spring engaging the click plate is installed fixedly on the guide member, as the case may be, a concavity or convex on the click spring slides on an area of radial projections and recesses on the click plate, keeping elastic contact with the area, to click the operating member.

5. A combined control-type electronic component according to any of claims 1 to 4, wherein a recess round and deep in the direction of the rotation axis of the operating member is made in each end surface of the operating member, the contact member and the terminal plate are inserted in the recess of one end of the operating member and the click spring and the click plate are inserted in the recess of the other end of the operating member.

6. A combined control-type electronic component according to any of claims 1 to 5, wherein the guide member has a first supporting part on one side of the rotation axis of the supporting member and a second supporting part on the other side of the rotation axis, the first supporting part is provided with pivots on which the guide member turns, a pressing-down part is provided on such a surface of the second supporting part as faces the push switch unit, and the pressing-down part presses down the push switch unit when the operating member is pushed.

7. A combined control-type electronic component according to any one of claims 2 through 6, wherein the base is made of resin and the fixed contact members are inserted in the base so as to protrude from the base when the base is molded, and the fixed contact members are held by and fixed to the base.

8. A combined control-type electronic component according to any one of claims 1 through 7, wherein the rotary unit is a rotary encoder unit.

9. A combined control-type electronic component according to any of claims 1 to 8, wherein the circuit pattern is a radial conductive pattern formed plane-symmetrically on both sides of the terminal plate.

10. A combined control-type electronic component comprising a base of an insulating material to be installed on a circuit board, the base having thereon a push switch unit which outputs a signal when an operating member is pushed, a rotary unit which generates signals when the operating member is turned, and externally connecting terminals which transmit signals, outputted from the push switch unit and the rotary unit, to the circuit board, wherein;

the externally connecting terminals are connected to the circuit board, which is installed in an electronic device, and the operating member protrudes out of an aperture made in the front panel of the electronic device.

FIG. 1

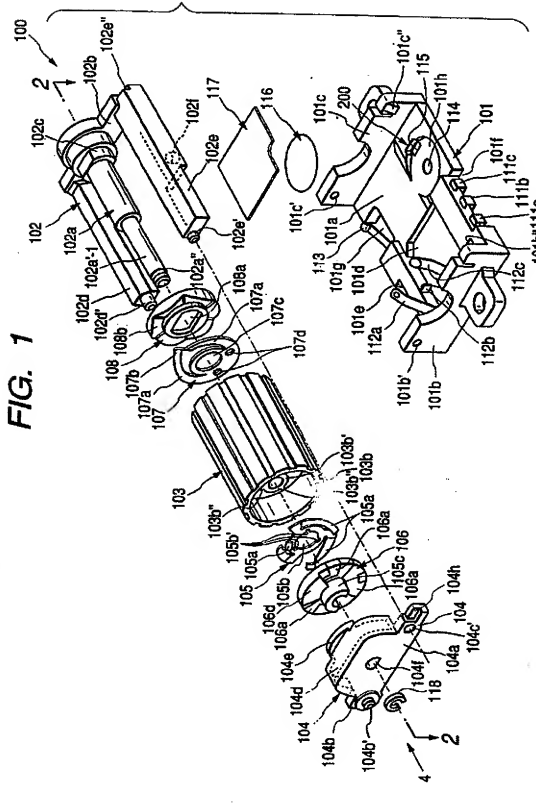
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FIG. 2

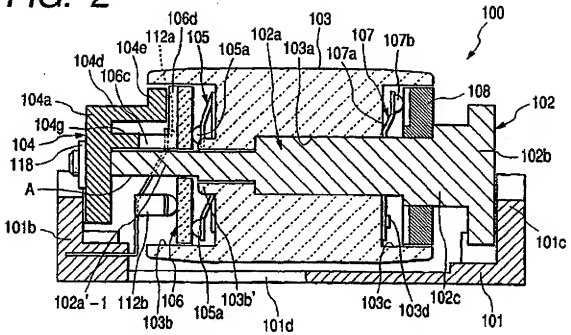
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FIG. 3

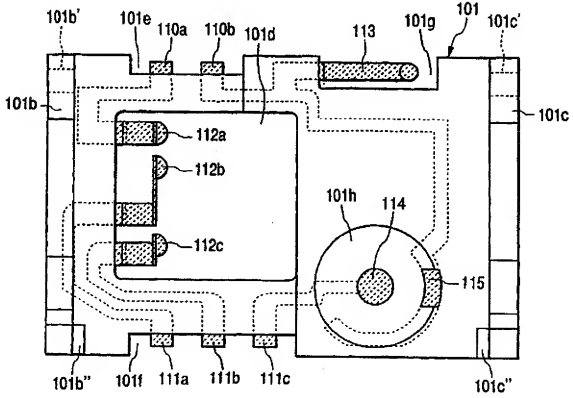
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FIG. 4

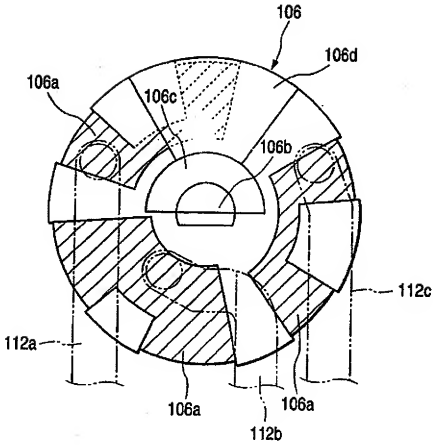


FIG. 5

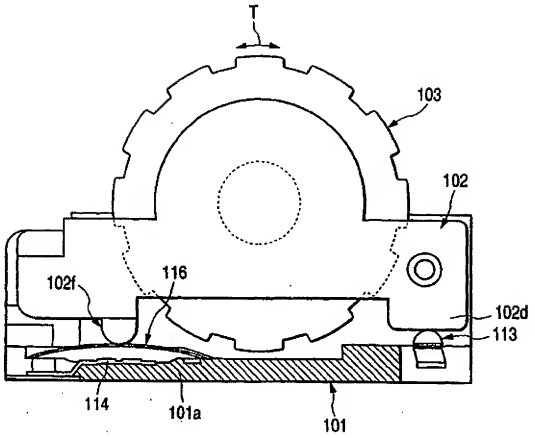


FIG. 6

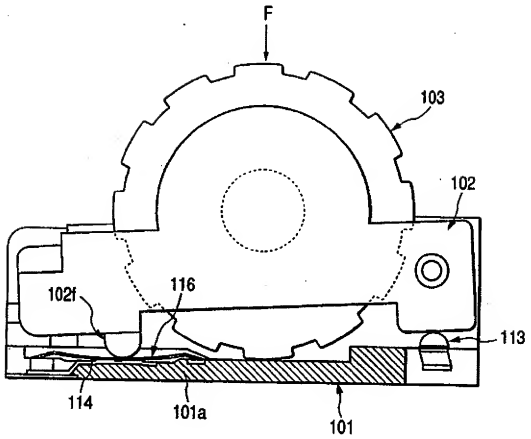


FIG. 7

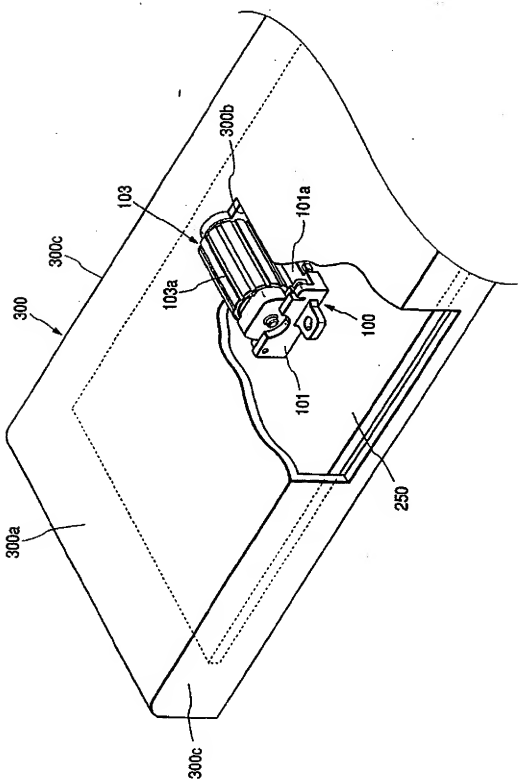


FIG. 8
PRIOR ART

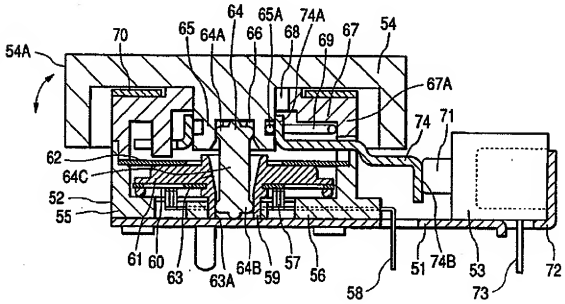


FIG. 9
PRIOR ART

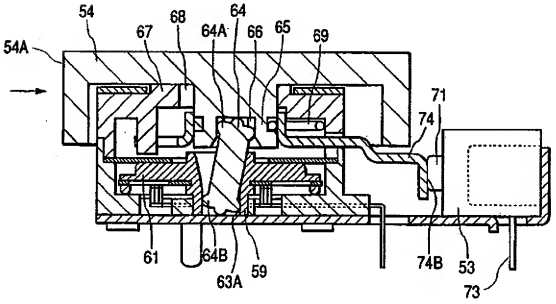
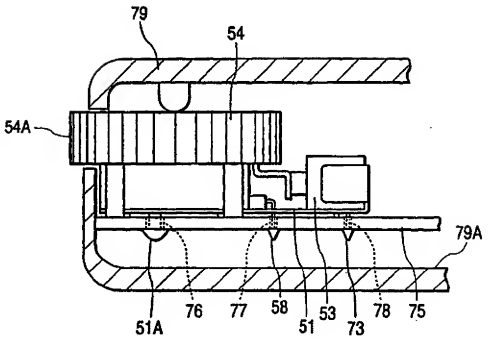


FIG. 10
PRIOR ART



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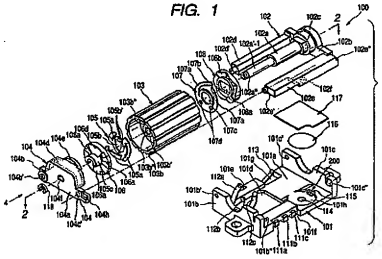
(54) Combined control-type electronic component

(57) There is provided a combined control-type electronic component which has a base made of resin to be installed on a circuit board. Installed on the base are a push switch unit, a rotary encoder unit which generates signals when a roller is turned, and externally connecting terminals which transmit signals, outputted from the push switch unit and the rotary encoder unit, to the outside. The roller is supported by a stepped shaft with a rotation axis disposed generally parallel to the surface of the circuit board. The stepped shaft is cantilevered to a base of a guide member, which in turn is supported by the base so that the roller can move in an orthogonal direction relative to the rotation axis of the stepped shaft. When the roller is pushed, the guide member is displaced, which causes the push switch unit to function.

FIG. 1



EP 1 094 483 A3

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EUROPEAN SEARCH REPORT

Application Number
EP 00 12 2733

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 959 267 A (INOUE SATOSHI ET AL) 28 September 1999 (1999-09-28) * the whole document * ---	1-10	H01H25/06
A	US 5 847 335 A (ONO KOJI ET AL) 8 December 1998 (1998-12-08) * description * -----	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	23 December 2000	Zugarek

CATEGORY OF CITED DOCUMENTS

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23-12-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5959267 A	28-09-1999	JP 11121209 A	30-04-1999
US 5847335 A	08-12-1998	JP 10064705 A	06-03-1998
		CN 1175784 A,B	11-03-1998

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82